Data Ordering Genetic Optimization (DOGO) – A Data-Driven Quality Estimate for Every Observation

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1. Quality Flags

- Space-based data sets (e.g., OCO-2, OCO-3) often contain quality flags.
- Guide users to find data to use for their analyses.
- Quality flags are great utility, but have drawbacks:
  - One-time optimization – not customized for your analysis
  - Assumes data is good or bad – data quality is not Yes/No; throw away too much data

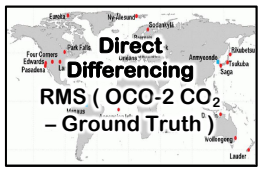
2. Instead of Flags, Order the Data

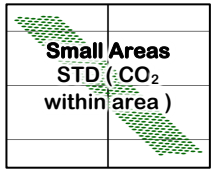
- No good or bad decisions, cutoffs, and lost data
- User specifies how much data from best to worst
- Tunable filter specific for every analysis
- Specify filtration strategy by a single threshold value
- Reproducible results, more comparable findings

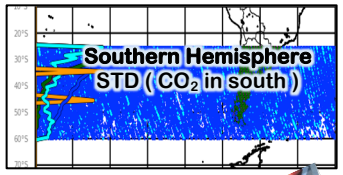
3. Data Driven – Data Ordering Genetic Optimization

Turn the objections into statistical metrics to optimize

- Minimize MEAN(MONTHLY(STDEV(CO2))) in south
- Minimize MEAN(STDEV(CO2)) at small spatial scales
- Minimize RMS(CO2 – ground_truth_CO2)







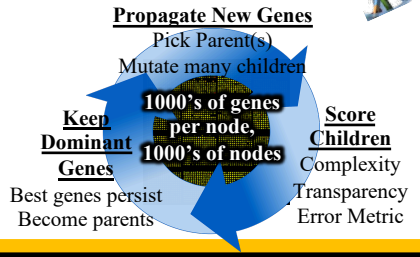
Gene = Data Quality Flag

- Define the gene
- Judge the gene
- Gene metrics

Field	Lower Limit (> or =)	Upper Limit (< or =)
Outcome flag (not in lite file)	N/A	2
Preprocessors/h2o_ratio	0.700	1.030
Preprocessors/co2_ratio	0.995	1.025
Preprocessors/dp_apb	-15.00	5.00
Retrieval/dp	-5.00	10.0
Retrieval/aod_ice	N/A	0.050
Retrieval/Aod_sulfate	N/A	0.400
Retrieval/Aod_dust*	0.001	0.30
Retrieval/Co2_grad_del	-70.0	70.0
Retrieval/albedo_2	0.10	N/A

Genetic Optimization

- Optimize a function
- Large compute resources
- Handle poorly behaved data that may be noisy



4. Results - Warn Levels

Every Observation Gets Its Judgement

- DOGO produces optimal quality flags for every 10% data accepted
- Each observation is examined: how many quality flags would reject it? 0 rejection => Warn Level 0
- Warn Levels are officially delivered to OCO-2 & OCO-3 user community
- Warn Levels are explainable

5. Future Work

- Expand DOGO to support more missions
- Simplify DOGO interface for easy use

6. Acknowledgement

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